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UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH **
MAY 1950

EROSION CONTROL PRACTICES DIVISION

Alta Fescue and Redtop Terrace Outlet - D. D. Smith, Columbia, Missouri.-"A low center outlet was established in late September of 1948 by use of manure and rock phosphate worked into the subsoil and with an N-P-K starter fertilizer on the surface. By the following May the alta fescue and redtop mixture had developed sufficiently to carry runoff safely. No lime was used. Ammonium nitrate 100 lbs. per acre is applied in the spring and fall. The grass is mowed for hay early in June."

Semi-Deep Furrow Drill Gave Good Wheat Stands even where a lot of Residue was on Ground Surface - Torlief S. Aasheim, Havre, Montana.-"Seeding on the Froid tillage project was completed on May 5. Seeding operations were delayed because of a cold wet spring. A semi-deep furrow drill was used in seeding all plots except those seeded with a oneway seeder. The semi-deep furrow drill worked very satisfactorily.

"There was a lot of trash on the surface, particularly on some of the chemical fallow, but the seed was placed in a satisfactory position on all plots and good stands resulted. For some reason the soil crusted very severely after seeding and some of the wheat had difficulty in getting through this crust. This crusted condition seemed to prevail regardless of the fallow method.

"Weed infestation seemed very heavy on some plots when last observed on May 26. Moldboard plowed fallow was definitely cleaner than other types.

"Soil moisture samples taken on the Froid project during the month contained good moisture in most cases to the sampled depth of five feet. Percentages have not yet been calculated but it appeared as though stubble land had nearly as much moisture as the fallow. This high moisture content in stubble land is no doubt due to the fact that the stubble held considerable snow during the winter."

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Is This One of the Answers to the Question of How to Get Better Birdsfoot Trefoil Quicker? - George R. Free, Marcellus, New York.-
 "Since 1941 when a field test of various legumes and grasses was started at the Marcellus Station, I have been very much interested in the reasons for the slow start that we have consistently experienced with birdsfoot trefoil. Some time ago I began to wonder whether inoculation of the soil prior to seeding might not be at least a partial remedy. In December 1948, small plots were spaded on Lyons and on Aurora soil at the Station. Some of these plots were then inoculated with soil from an area where birdsfoot was already established and some received no treatment at that time. Nothing further was done until August 24, 1949 when all plots were fertilized with 0-20-10 and seeded using seed that had been treated with commercial inoculant. This spring the plots inoculated with soil in December prior to seeding show excellent stand and growth while the others are very poor. The contrast is marked and is something that can be seen at a distance. There are many 'loose ends' in this trial and it should be repeated with other treatments so that the question of whether the success was a function of quality of inoculant or time can be answered. If it is chiefly a function of time, it might be desirable to either pre-inoculate an area specifically for birdsfoot or be sure that the birdsfoot Rhizobium was present in inoculants sold for alfalfa and clover in those areas where birdsfoot would be used later.

"Duplicate plots were used for this initial trial and the fact that the results were so marked on both soils is very interesting. The Lyons soil, of course, is wet and was in fact covered with water until recently. The Aurora is on poor pasture at the rear of the farm where fertility is very low.

"Birdsfoot seeded on a larger scale on a new area of Honeoye cropland on the Station last August was almost completely winterkilled although it appeared to be off to a fair start late last fall."

Crop Residue and Tillage Studies - B. H. Hendrickson, Watkinsville, Georgia.-"After 2 years of wheat-lespedeza seed crop practice, Mr. John R. Carreker prepared lespedeza sod land for cotton in the early spring of 1950 using 4 different implements. In early May, after cotton was up to a good stand, he sampled the topsoils to the 1-inch depth to determine their content of stubble mulch residue material with the following results:

Table 1.--Amounts of residue in top inch of soil.

	<u>Ripper</u>	<u>Disc harrow</u>	<u>Disc tiller</u>	<u>Disc plow</u>
		Tons per acre		
Block A	.92	1.03	0.73	0.55
Block B	1.17	1.14	0.27	0.27
Average	1.04	1.09	0.50	0.41

"The disk harrow and the ripper left considerable residue in the top surface inch of soil, whereas the disk tiller and disk plow distributed at least half of it to plow depth.

"It is known that residues on or near the surface favor better infiltration and reduce erosion losses appreciably, but, on poor soils especially, the turn-under practices favor somewhat better production of the following row crop.

Agronomy Notes - Climatic Conditions and Management in Relation to Stands of Certain Legumes - "Mr. W. E. Adams reports that annual lespedeza - principally Kobe - is going to be a failure this year due to frost, a severe early spring drouth, and weed competition. Biennial white sweet clover seeded in the spring also has failed to make a stand for the same reasons, but November seedings have survived well in small grain.

"Late summer hay cuttings made annually over a 6-year period have caused serious reduction in stand of well established sericea, and the proportion of weeds has increased. One early hay harvest plus a fall seed harvest, or two early hay crops, or only an annual seed harvest have maintained satisfactory stands of sericea. Kudzu has been practically killed out by long repeated June 1 and September 1 mowings, for 6 years. A July 15th, or a mid-July and mid-October mowing schedule has maintained excellent stands.

Notes on Upland Pasture Development - "A kudzu-based Station trial pasture oversown to oats, ryegrass and reseeding winter legumes was closed to cattle for 2 months beginning April 15, for 2 purposes: (1) to permit winter annuals to reseed and (2) allow kudzu to recover a full stand.

"A drove of pigs has also had access to this pasture during the winter. They have been allowed to continue to graze in this pasture since then so that we could assess the possible damage to young kudzu due to hog grazing.

"Present indications are that the pigs are stripping off the ripening oat grains, not appreciably grazing on the kudzu.

"Maintaining some kudzu growth indefinitely, under control, is a reasonable farm procedure, certainly much better than letting this valuable deep-rooted legume vine get out-of-control and become a nuisance. Producing a succession of rapid-growing winter annual grazing crops on the same land during the kudzu's dormant season has proved to be practical and very much worthwhile.

"If it proves successful, this type of pasture management, on steep eroded hillside land, could furnish another example of a good land use method."

An Attempt to Devise a Simple and Rapid Method to Measure the Susceptibility of Soils to Wind Erosion - Charles J. Whitfield, Amarillo, Texas. - "A small metal tray was prepared, with a slot in the bottom measuring 1 x 2 inches. In practice, the tray was placed on the ground and the soil crust exposed through the slot was brushed ten uniform strokes with a small paint brush. The soil granules dislodged were collected

on the tray. Twenty such increments were composited, weighed, and separated into four different size classes ranging from .05 to over 1 mm by sieving. The 1/2-1 mm. fraction proved to be most easily duplicated, being least affected by length of time of sieving and other variables. The proportions of soil in the finer fractions were too erratic for any conclusions to be drawn. A typical analysis of surface crust from plots which had been in continuous sorghum and continuous wheat for eight years is shown:

Treatment	Sample No.	Weight Sample ^{1/} (grams)	Percent soil in 1/2-1 mm. aggregates
Continuous sorghum	1	8.64	27
	2	6.96	32
	3	11.35	33
	4	11.01	32
Continuous wheat	1	18.85	20
	2	10.81	25
	3	15.18	20
	4	14.52	23
^{1/} Each sample composite of 20 subsamples.			

"Wind tunnel tests had shown the continuous sorghum land to be more erosive. It will be noted that both the size of the sample collected and the proportion of the 1/2-1 mm. aggregates in the soil were greater from the less erosive field. The wheat plots had been more recently tilled which may have caused the contradiction of the larger sized sample to be collected from those plots. It is believed that the sampling techniques have considerable merit, especially where the soil surface is relatively smooth. It would appear, however, that the basis for estimating the erosivity of the soil should be the proportion of 1/2- 1 mm. aggregates rather than the size of the sample collected."

The Nature of the Injury to Barley Seedlings by Occluded Straw - Maurice Donnelly, Riverside, California.-"The Pacific Region is dominated by the Pacific type of climate in which most of the rain or snow falls in the coldest part of the year. In grain growing in this Region summer fallow is generally practiced where average annual rainfall is under 18 inches. Summer fallow is essentially a two-year rotation in which the land is in fallow one year, in crop the next. Because little rainfall is normally expected after the first spring operation in summer fallow preparation, the effect of this operation, especially on soil water, is critical.

"Under some conditions of the use of crop residues for surface protection, injury to barley seedlings has been observed. The reasons for such injury have been puzzling and have given rise to considerable speculation. This project has carried on a number of studies to determine the nature

of this injury. Conclusions from these studies are summarized below. To facilitate interpretation of these findings, straw from a previous grain crop is classified according to position into three groups:

(a) Surface straw lying on the soil surface after seeding. (b) Buried straw that has been incorporated into the soil by cultural operations previous to the time of seeding. (c) Occluded straw that is pushed into the soil around the seed by the seeding operation.

1. The leachate from surface barley straw is not toxic to barley seedlings. On the contrary, this leachate has usually given a boost to the growth of barley.
2. The primary leachate from surface barley straw, as analyzed by Dr. James P. Martin, contains about one-fourth of the total nitrogen in the straw. Nitrogen content of this leachate ranged from 2 to 3-1/2 per cent. It is not considered likely that such a leachate would in itself be responsible for temporary nitrogen lock-up. The primary leachate is approximately equivalent to the material that would be leached from surface straw by the first heavy fall rains.
3. Buried straw does not appear to be responsible for injury to barley seedlings.
4. Occluded barley straw ordinarily causes injury to barley seedlings. There is close correlation between the amount of occluded straw and the severity of the injury -- the more occluded straw, the more damage.
5. Part of the damage brought about by occluded straw is mechanical in that the soil surrounding the seed loses moisture to a greater extent than would be the case with no occluded straw. The mechanical damage is not believed to be the major factor.
6. The major factor in the damage is considered to be nitrogen deficiency resulting from microbial activity, immediately around the seedlings, on a material high in carbon. The first heavy rains will leach most of the readily available nitrogen from the occluded straw and carry it below the zone of seedling root activity. The residue of occluded straw causes nitrogen lock-up from microbial activity. As this residue material is relatively refractory, the nitrogen lock-up may persist for a considerable period of time.

I am indebted to Dr. Francis Broadbent for a theoretical analysis of this microbial effect on occluded straw.

7. Attempts have been made to begin the practice of stubble mulching on a field where straw residues have been piled up by windrowing in the previous harvesting operation. It is difficult or impossible to spread windrowed straw in such a way that there is no straw occluded with the seed at planting time.

"This points to two practical recommendations: (a) An initial step in preparing grain land for stubble mulching is to spread the straw at harvest. (b) Where grain land bears straw already windrowed, consideration should be given to deferral of stubble mulch practices until the next crop sequence, at which time the straw should be spread, not windrowed."

Crop Rotations for Soil and Water Conservation - O. R. Neal, New Brunswick, New Jersey.—"Erosion begins whenever water runs over and off the soil surface. Runoff begins whenever the rate of water applications exceeds the rate of water intake by the soil. Runoff may thus be the result of either high rates of rainfall or irrigation applications or the result of low rates of water absorption by the soil. All of these factors except rainfall are subject to some measure of control. Rate of irrigation is entirely controllable. There is no justification for applying irrigation water at a rate that results in runoff and erosion. The rate of water absorption by the soil can also be varied over a period of time. The rotation of cultivated crops with non-cultivated crops improves physical soil conditions which regulate water absorption. Vegetation, including row crops, protects the soil surface from puddling by raindrops and thus increases water absorption. Close-growing crops, such as grass-legume sods, provide better surface protection and are more effective in reducing runoff. Sod mixtures also add organic matter which improves internal moisture properties of the soil. This results in increased water absorption, movement, and drainage when needed.

"These soil management conservation practices can be expected to eliminate runoff from many soil areas during low-intensity storms. During high-intensity summer storms these practices will reduce, but not eliminate, runoff. It thus is necessary, on most areas, to supplement these practices with mechanical conservation measures in order to have effective soil and water conservation under all storm conditions. The supplementary nature of the mechanical practices should be kept in mind. The management practices which maintain water absorption rates in the soil appear to be essential in all cases. It presumably would be possible, in an extreme case, for poorly managed soils to fall to a zero infiltration rate. On such soils mechanical conservation measures would slow down the rate of runoff and reduce the soil loss, but no water conservation would result. Incidentally, of course, no crop growth would occur. This is a fanciful extreme, but it is hoped that it will illustrate the point in mind. If our conservation program is to be effective, long-lasting, and attractive to the land-owner, it should not only provide adequate control of soil and water losses but should also increase the efficiency of crop production wherever possible. There is much evidence that this is quite possible.

"Data from numerous stations over the country have shown the conservation value of crop rotations and reduced intensity of cultivation. In New Jersey losses of soil and water have been measured from each of the crops in 4 different rotations. These rotations vary in intensity from a system of continuous clean cultivation without winter cover to a system of 2 cultivated crops rotated with a grass legume sod plus winter cover and a compost application once each rotation cycle. Soil and water losses from these two systems are shown in the table on the following page.

Annual soil and water losses from two cropping systems

Crop	Continuous Cultivation		Sod Rotation	
	Soil Loss	Runoff	Soil Loss	Runoff
	Lbs./A	Sur. In.	Lbs./A.	Sur. In.
Grass-legume sod			94	1.18
Peas followed by beans	4485	4.46		
Tomatoes	4399	4.15	1785	1.31
Sweet corn	4307	4.98	1959	1.89
System Average	4397	4.53	1279	1.46

"The two intermediate cropping systems showed soil and water losses that were intermediate to the values shown. Two main points should be considered in connection with the data in the table. The first, and most obvious, is the reduction in soil and water loss, even from cultivated crops, under the sod rotation. Average losses are reduced by about two-thirds under the sod system. The second point is the fact that losses, though reduced, continue to occur under the good rotation. It is on land under this type of management that contouring, strip-cropping, and/or terracing - depending on the need - can be applied most easily and effectively. With such a combination of conservation measures the soil should be maintained permanently in a productive condition.

"Crop yields, which will be discussed in some detail later, have been much higher under the sod rotation. During the past 4 years, with identical fertilization and cultural operations, tomato yields have been 34% higher and sweet corn yields 46% higher from the sod rotation than from the continuously cultivated system!"

The Effect of Different Types of Protection and Soil Conservation Practices Easily seen after 6 to 10 Inch Rain - F. L. Duley, Lincoln, Nebraska.-"A very heavy rain of 6 to 10 inches fell on the Salt Creek and Nemaha Creek watersheds which drain a considerable part of the south-east corner of Nebraska. Most of this rain fell in about four hours and thus greatly exceeded Yarnell's calculated 100 year frequency. The flood struck the west side of Lincoln and a number of smaller towns. Twenty-three lives were lost and enormous property damage occurred.

"Observations made following this heavy rain showed that soil losses had been very heavy. The effects of different types of protection and soil conservation practices were very easily seen. Wherever there was good grass cover there was of course little sign of erosion, except where a gully was cutting up a drainage way. On wheat land there was some erosion, especially where the rows were up and down hill, but the overall value of wheat at this stage of growth for protecting the soil was well demonstrated. Oats were not far enough along to give very effective protection, but where farmers had left considerable cornstalks on the surface and the oats had made a fair growth the erosion was less serious than might be expected from such a rain. Cornstalk land that had heavy stalks and which had been mashed down with a cornpicker and where the land had not had much working also held the soil surprisingly well. On the other hand, where there were only light stalks and where the land had been heavily disked erosion was very severe. Plowed land and

especially fall plowed land lost enormous quantities of soil. Only a small amount of the land had been listed at the time of this rain. In areas where farmers had a good soil conservation program in operation, including terracing, contour farming, grassed waterways and a good cropping system, erosion was held to a reasonable amount considering the intensity of the rainfall. A movement is on foot to organize this Salt Creek Watershed into a special district in a concerted effort to reduce the flood hazard."

Soil Loss During Spring Runoff Serious This Year - Hugh C. McKay, St. Anthony, Idaho.-"The soil loss during the spring runoff was more serious in 1950 than any previous year on the dry land farms of this area. It brought home the fact to most of the farmers that something will have to be done to prevent further loss.

"Many requests have been received for aid with tillage practices, crop rotations and gully seedings. Many farmers are now using sweeps for their summer fallow operations. However, most of them are still using them incorrectly and are not getting as good of results as could be obtained if properly used. This would indicate that we still need a more intensive education program with both the farmers and the equipment dealers. The equipment dealers are still mainly interested in selling equipment. When they deliver a piece of equipment, they do not remain long enough to see if the equipment will work satisfactorily under the conditions present. Some of them still have much to learn on how their own equipment operates.

"The use of the rotary hoe has spread very fast. When we first used it on the station, there was not another one in the area and it was several years before anyone became interested in them. This year, nine out of ten farmers have rotary hoes and are using them extensively.

"We are planning on having a tillage demonstration in this area later this summer for both the farmers and implement dealers to see if we can't bring about a better use of the equipment already in operation. I believe we have equipment that will do the job if we can get the farmers to use it properly."

Winter Losses from Sub-Surface Tillage - Orville E. Hays, LaCrosse, Wisconsin.-"We have reported previously on the greater amount of runoff from hay and grass land than from plowed land during the winter months. More of the snow is lost from hay land as runoff due to the fact that the vegetation insulates the ground so that frost removal is much slower than from plowed land. During the past winter, runoff and soil loss were measured from hay land worked with the Graham-Hoeme plow and the mold board plow. The Graham-Hoeme left most of the residue on the surface.

"Runoff was 2.3" and 0.33", soil loss 0.2 and 0.1 tons per acre, respectively, from sub-surface tilled and plowed land. The soil loss was low in each case, but the runoff was seven times as much from the sub-surface tilled land as from the plowed land. It would appear, from this year's results, that the residue on the surface acts very much like unplowed vegetation as it influences winter runoff.

Wheel Sampler - "One of the Coshocton wheel samplers has been installed in one of the Control Plot tanks so that all of the runoff flows over the wheel and is caught in the plot tank. A smaller tank is installed inside of the large tank and catches the aliquot from the wheel sampler. Runoff and soil loss data are now available from two storms. The one of May 5 was of high intensity, with 30-minute intensity of 2.64 inches per hour. The storm of May 8 and 9 had a 30-minute intensity of only 0.54 inches per hour.

Date of Rain	Pounds of Runoff		Percent Aliquot by Wheel	Soil Loss		
				Tons/Acre Tank	Wheel	Percent Variation
May 5	3574.0	48.0	1.34	38.45	40.48	+5.28
May 8-9	1106.5	14.5	1.31	3.47	3.76	+ 8.36

"The wheel gave very good results for these two storms. The percent aliquot did not vary appreciably, and the percent variation in soil loss was within 10 percent."

Erosion is Seasonal - C. A. Van Doren, Urbana, Illinois. - "For the nine years for which measurements are available, 63.7 percent of the soil losses from corn plots on the contour occurred during the month of June and 26.5 percent during the month of May. Almost 96 percent of the soil losses occurred during the four months April through July. June was likewise a critical month for runoff, as 53.1 percent of the average yearly runoff occurred during June.

Soil and Water Losses from Plots in Corn During 4 Critical Months -- Contour Planted - 1941-49

<u>Month</u>	<u>Soil Losses in % of Annual</u>	<u>Water Loss, % of Annual Runoff</u>
April	1.2	1.0
May	23.5	23.9
June	63.7	53.1
July	4.3	9.2
4 months	95.6	87.1

First Year Yields of Possible Reseeding Legumes - E. C. Richardson, Auburn, Alabama. - "Several different possible reseeded legumes were planted on Norfolk loamy sand just south of Auburn and on Cecil sandy clay loam at Camp Hill, Alabama, in October 1949. Excellent stands were obtained of all plantings both at Camp Hill and Auburn, and excellent growth was obtained.

"By early May most of the plants were blooming freely and had reached maximum vegetative growth. At this time different areas were clipped, weighed, and calculated to a per-acre basis. Small samples were obtained from each area clipped and dried in an oven which gave the dry material in each sample. Percentage dry material and total yields of dry matter per acre of each legume were calculated as reported in tables 1 and 2.

Table 1.--Yield of Winter Legumes

Crop	Green weight lbs./acre Late March	Green weight lbs./acre May 1, 1950	Dry Weight %	Dry Weight lbs./acre
<u>Cullars Farm</u>				
Button clover	27,184	28,233	24	6,776
Subterranean clover	25,813	50,820	18	9,149
Crimson clover	37,510	29,040	24	6,970
Bur clover	19,682			
Smooth vetch	22,909	38,720	18	6,970
Hairy peas	20,731	22,586	25	5,646
Grandiflora vetch	28,314	27,427	23	6,308
<u>North Auburn</u>				
Hairy peas	19,965	20,274		
Commercial Caley peas	12,136	18,312		

Table 2.--Yield of Winter Legumes, Camp Hill, Alabama.

Crop	Green weight lbs./acre Late March	Green weight lbs./acre May 1, 1950	Dry Weight %	Dry Weight lbs./acre
Ball clover	26,160	41,856	14	5,860
Hairy peas	15,369	23,947	19	4,550
Smooth vetch	13,904	22,236	21	4,669
Grandiflora vetch	12,719	15,260	28	4,273
Crimson clover	16,856	14,388	33	4,748
Button clover		17,004	26	4,421
Subterranean clover	17,023	40,548	16	6,487
Woolly pod vetch	13,225	18,314	24	4,395
Bur clover	9,800			
Hairy peas	27,346	37,278	19	7,082
Commercial Caley peas	12,826	19,620	17	3,335

Results: "At both Auburn and Camp Hill, subterranean clover gave the highest yield, closely followed by crimson clover. Higher yields were obtained at Auburn than at Camp Hill. At Auburn subterranean clover produced 4-1/2 tons of dry matter per acre, while at Camp Hill a yield of 3 tons was obtained. The other legumes at Auburn produced approximately 3 tons of dry matter, while those at Camp Hill produced approximately 2 tons of dry material per acre.

"At North Auburn hairy peas reached their maximum growth from late April to the middle of May. On the Camp Hill Station hairy peas continued to grow, and in early May the difference in yields of the hairy peas and commercial Caley peas was even greater than in late March."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"A rainfall of 4.17 inches for the month fell on 12 days. The largest single storm produced 1.89 inches of rainfall. Maximum intensities for periods of 3, 5, 10, 15, 30, and 60 minutes were 4.35, 3.96, 2.94, 2.28, 1.70, and 1.08 inches per hour, respectively. Runoff and erosion data on small watersheds appear in the following table:

Watershed No.	Area Acres	Land use	Runoff		Soil loss per acre
			Peak In/hr.	Total Inches	
103	0.65	Corn - I	1.44	0.42	2.6
110	1.27	Corn - P	3.66	1.10	8.8
128	2.68	Corn - mulch	1.92	.69	.2 (Est.)
192	7.86	Corn - P	2.29	.88	2.2
185	6.87	Corn-Mead. Strips	.99	.31	No record
187	7.20	Wheat-Mead. Strips	.10	.30	No record

"The difference between the runoff and erosion from the conservation-practice watershed 103 and that from the poor-practice watershed 110 can be attributed largely to the difference in soil conditions. Contours were of little affect as the corn had been planted but not yet cultivated. Better sod crops preceding corn on the former possibly resulted in a better absorptive capacity of the soil in the conservation area.

"Tillage operations were performed on different sections of a corn strip this spring in the attempt to (1) build a greater depth of topsoil quickly--a year or so and (2) provide a mulch protection to the surface of the soil. The differences in tillage operations were as follows:

1. Normal plowing, fitting, and seeding.
2. Plowing to normal depth (furrow slice turned on edge up hill), spring-tooth harrow to depth of 6 inches to pull up some sod residues for mulch, disking lightly, and seeding.
3. Same as No. 2 except plowing to 8-1/2-inch depth.
4. Same as No. 2 except plowing to 10-inch depth.
5. Disking sod for mulch cornland plus normal fitting and seeding operations.
6. Subsoiling plus lime and fertilizer applications to depth of 14 - 16 inches.
7. Planting rate increased on all mulch areas in attempt to overcome stand deficiencies which have occurred in former years.

"A bulletin on contour fencing for joint publication with the Ohio Agricultural Experiment Station was completed and forwarded to that Station for publication. This bulletin gives results of the first two and one-half years of testing in our research experiment on contour fence construction. It also gives simplified recommendations for farm construction of curved fences."

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas. - "Total rainfall for the month at Station 69 was 2.99 inches. The only month this year when rainfall has been in excess of normal was February, and the only date of any appreciable runoff was on February 12 when approximately 2 inches of rain fell. In spite of the relatively low rainfall, totaling about 12.5 inches through May, there is greater subsoil moisture at this time than at any time since 1947. The extremely dry weather of late February, March, and the first 10 days of April greatly reduced oat yields, but prospects for other crops are excellent at this time.

"On May 17, soil samples from the Y and W areas showed the following percentages of moisture at the designated depth intervals: Y area with applied conservation measures--0-6 inches, 31.6 percent; 6-12 inches, 29.3 percent; 12-24 inches, 29.9 percent; 24-36 inches, 29.6 percent; 36-48 inches, 29.1 percent; and 48-60 inches, 29.0 percent. W area with conventional farming practices--0-6 inches, 26.9 percent; 6-12 inches, 26.5 percent; 12-24 inches, 25.9 percent; 24-36 inches, 25.3 percent; 36-48 inches, 24.5 percent, and 48-60 inches, 25.8 percent. These are the means from samples of the two areas from cotton, corn, and oat crops. The Y area with conservation measures applied had at this sampling date a mean of 29.7 percent moisture in comparison to 25.8 percent in the W area down to a 60-inch depth, a difference of 3.90 percent in favor of the conservation farmed area."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska. - "Rain was received at the Meteorological Station on 13 days during May. The total catch was 3.91 inches or 0.57 inch above the long-time May averages. This is the first month this year when the monthly rainfall was above normal; we have an accumulated deficit of 2.92 inches for the first 5 months of 1950.

"On May 19, 1950, a special report was prepared for the Chief, Division of Drainage and Water Control, Regional Director, State, District, and Work Unit Conservationist on the progress of placing Watershed W-5, containing 411 acres, in conservation practices. The various SCS Operations offices have been cooperating with Research in this program. Much could be said of their desire and appreciation of the need of hydrologic data of this nature, which has inspired this program. The State Experiment Station are also very interested in this work along with our other studies.

"The following table shows an owner breakdown of the terraces constructed on watershed W-5:

Table 1.--Status of terraces constructed on watershed W-5

Owner	Built in 1949 feet	Built in spring 1950 feet	Built to date feet	To be built feet	Remarks
Lena Spilker	4,500	16,100	20,600	1,900	1,900' in wheat
Ernest Sack	0	6,000	6,000	1,400	1,400' in oats
August Lampman Est.	7,300	3,500	10,800	8,700	Approx. 8,700' in sweet clover
Wm. Schumm	0	0	0	12,000	Non-cooperator
Fred Lampman	0	0	0	5,400	4,500' in alfalfa
Clarence Hartman	0	0	0	2,200	2,200' in wheat
Total	11,800	25,600	37,400	31,600	55% of all terraces built to date

"In addition to the terraces completed considerable work has been done on shaping, seeding, and establishment of grass waterways. Eleven waterways which were last seeded in the fall of 1949 are showing very favorable progress. Six of these waterways are in excellent condition, with very good stands of grass; three are in fair condition and the other two will probably require some patching up this fall.

"On May 8, 1950, watershed W-5 received 0.92 inch of rain which fell in approximately 30 minutes. According to Yarnell the 15-minute intensity exceeded the once in 2-year expectancy. The oats and corn land, comprising roughly 40 percent of the area, offers very little protection to the ground during this time of the year, since there is very little if any cover. None of the terraces broke during this short intense storm. The peak rates of runoff at gaging station W-5 were less for this storm than for a storm which occurred on May 2, 1944, when the intensities were less than half as great and the total rain was one-third less. We of course cannot base any conclusions on these two storms, but it is an indication that when an area is slightly over 50 percent treated that peak rates of runoff will be reduced."

Hydrologic Studies - R. B. Hickok, LaFayette, Indiana.-"Corn plots at LaFayette and Albion were prepared and seeded in good order. The Grahame-Noeme "plow" (a heavy spring tooth field cultivator), with sweep attachments above the cultivator points, was used this year in place of the broad sweep equipment that has previously been used for plots on which it was intended to retain the maximum quantity of residues on the surface. The broad sweeps alone have never prepared a satisfactory seed bed for corn and the plots prepared in this manner have consistently produced considerably lower yields than other systems tested, notably those with residues mixed into the soil. The equipment used on the surface mulched plots this year probably resulted in lesser retention of residues on the surface than has been accomplished in other years with the broad sweeps; but, substantially greater retention on the surface than where disks have been used. Operations with the equipment used this year were relatively trouble-free and rapid, and corn seeding more satisfactorily accomplished.

"Engineers from the Richmond (Indiana) Plant of IHC worked with us in seeding of corn on the residue management and mulch tillage plots at both Lafayette and Albion (Also on the experimental watersheds at Lafayette), with particular interest in developing an improved fertilizer attachment for the planter. Experimental attachments which they tested apparently worked quite satisfactorily and eliminated difficulty previously experienced with trash and/or soil being pushed ahead by the conventional split type fertilizer boot, into the seed boot, plugging the latter. The IHC men have expressed considerable interest in our corn-mulching experiments and the desire to continue work on development of planting equipment particularly suited to working through 'trash.'"

Hydrologic Studies - G. A. Crabb, Jr., East Lansing, Michigan.-"Precipitation for the month of May, as measured by the U. S. Weather Bureau type of standard non-recording rain gage, amounted to 1.36 inches at the cultivated watersheds, 2.22 inches at the wooded watershed, and 1.31 inches at the stubble-mulch plots. These amounts are approximately 40 percent, 65 percent, and 38 percent of the 50-year average May precipitation of 3.42 inches. May precipitations can be expected to equal or exceed 1.36 inches once in 1.2 years. There was a trace runoff at the wooded watershed on May 25. There were no runoffs at watershed A or B during the month.

"Because of the fact that so much of the Research Station's data are intimately connected with meteorologic phenomena, Professor Karl A. Vary, Department of Agricultural Economics, Michigan State College, requested some assistance in evaluating the causes of the rather wide-spread poor quality of hay-cured in this area. A combination of 31 years of Research Station and U. S. Weather Bureau records indicated that the occurrence of weather often falls into fairly dependable patterns. Such patterns may be used to show the probable weather most likely to occur during a given period. For example, records for south central Michigan show that farmers may expect to encounter greater difficulty harvesting forage for hay during the last 2 weeks in June than in the first 2 weeks. During the latter part of June, precipitation occurs with greater frequency and magnitude than during the first part. There is much more chance of there being good haying weather (two or three consecutive days without rain) during each of the first 2 weeks in June than in the last half of June. During the last half of June, an analysis of the records shows that consecutive rain-free days can be expected to amount to only one or two during the last half of June. The general practice in this section of undertaking hay harvesting during the last half of June, when related to the above pattern of weather, may explain some of the poor quality and damaged hay being harvested each year. Tables and charts showing the average conditions in May and June for this section follow. Averages for the balance of the summer are being prepared. The poor expectancy of suitable haying weather in June would indicate that more emphasis might well be placed on grass silage as a feed crop in Michigan, at least for the usual first hay-cutting. Later cuttings apparently do not have quite as bad conditions on the average. Analysis now under way will definitely prove or disprove this fact. It is felt that the chart showing the relationship between solar radiation, relative humidity, evaporation, and precipitation is especially worthy of study. No clearer picture of this relationship has been seen by the Station Supervisor. These tables and charts can be obtained directly from the project on request."

Hydrologic Studies - A. W. Cooper, Auburn, Alabama.-"The May rainfall of 2.43 inches represents 68 percent of the 69-year average of 3.56 inches for Auburn.

"The two 20-percent slope erosion plots were planted to Dixie #18 hybrid corn. The high-residue plot was fertilized with 1,000 pounds of 6-8-4 fertilizer, and the low-residue plot was fertilized with 250 pounds of 6-8-4. It is planned that the high-residue plot will be irrigated as needed, while the low-residue plot will receive only natural rainfall. Soil and water losses will be determined from each plot, and the amount of crop residue removed and left on the plot will be measured.

"Moisture samples were taken on the residue-management plots on May 12. The rain preceding the time that these samples were taken was 1.08 inches on May 1. The check plots averaged 18.8 percent moisture for 6 inches of depth as compared to 21.9 and 22.1, respectively, for the plots to which cotton stalks and blue lupine were applied. The rototilled plots averaged 20.8 percent moisture as compared to 22.0 percent for the spaded plots.

"Mr. Bowden continued work on the effect of various type storms and initial soil moisture on soil and water losses. Tests were made on Cecil clay with interrupted, delayed, advanced, and intermediate type storms at a medium moisture content. Advanced and delayed type storms were used on Decatur clay with low, medium, and high initial soil-moisture contents. A new procedure was used to prepare the plots for medium initial moisture tests. The results of these tests were more

consistent than any previous test at the medium initial soil-moisture content.

"Messrs. Cooper, Sanders, Thorton, and Conniff met with Messrs. Carreker, Beale, Law, Hendrickson, Adams, and Barnett in Watkinsville, Ga., on May 3 to discuss methods of measuring infiltration rates. The purpose was to try to decide on a standard method to be used in the field to measure infiltration rates as a guide to the rate of application of irrigation water. Mr. Beale explained the infiltrometer being used in South Carolina, and it was generally agreed that this was probably the best method suggested to date and should at least be used to check any other method. Mr. Sanders pointed out that to assist Alabama farmers SCS Operations personnel needed information on (1) when to apply water to various crops, (2) what rates of application to use on various soil types under different vegetative cover, (3) how much water to apply, and (4) the available water-holding capacity of the different soils in Alabama. After this meeting in a conference with Mr. Sanders, it was decided that the personnel of this project would compare three infiltration measurements--the South Carolina infiltrometer, the Texas infiltration rings, and make observations using two standard irrigation nozzles similar to a method previously suggested by Mr. Roberts, Zone Engineer. After this, infiltration measurements and available water-holding capacities will be made on as many different soil types in Alabama as possible."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.--"Precipitation at Fennimore for the month was 5.30 inches as compared to the normal of 4.03 inches. A total of 3.65 inches of this amount came in a 15-hour period on the 24th and 25th, with the maximum amount for a 20-minute period being 0.85 inch. The precipitation, runoff, and retention for the various watersheds are given in the table below. It will be noted from this table that the retention on W-II is much higher than on any of the other watersheds. This area has had a high percent of hay and pasture for the last several years. During this storm, double peak hydrographs occurred on watershed W-III as contrasted to the single peak which previously had been experienced on this area. The only change in the area is that one field near the weir was plowed, whereas usually the fields in the upper part of the watershed are the ones which are plowed. The first peak to reach the weir no doubt comes from this cultivated area just adjacent to the weir.

Table 1.--Fennimore, Wis., Watersheds

Watershed	W-I	W-II	W-III	W-IV
Drainage area	330	22.8	52.5	171
Total precipitation--inches	3.58	3.65	3.43	3.63
Total runoff--inches	.40e	.13	.15	.46
Retention--inches	3.18	3.52	3.28	3.17
Maximum rate of runoff in/hr.	.45	.29	.31	.50

"Total precipitation at Edwardsville for the month was 3.63 inches as compared to a normal of 4.2 inches. There were no high intensities and the total runoff from the 50-acre pastured watershed was 0.38 inch."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.--"Mr. Donnelly completed the wingwall studies made for the East Aldrich Creek Subwatershed. Tests made with low tailwater levels (1d_c over the end sill) resulted in a considerable increase in bed scour and severe bank erosion. Modifications to one model were made to discover the effect of certain changes. When the wingwalls at the approach to the weir converged at an angle of 30 degrees with the weir crest the flow conditions in the basin were slightly better. Scour still reached 2 feet

below the top of the end sill. When the basin width was made equal to the weir length, a further improvement in the flow in the basin was noted. However, the scour hole depth was 3 feet. In both instances the maximum depth of scour was obtained along the wingwalls. Mr. Freyburger visited the laboratory on May 4 to observe and discuss the results of these tests."

Drainage Studies - J. C. Stephens, West Palm Beach, Florida,--"Drought conditions continued over the Everglades during the first half of the month and the water table fell well below the surface to a point low enough for some of the organic soils to burn on after the widespread Glades fires which swept over a large part of the area. These fires were especially bad in the southern glades where they threatened the Everglades National Park bird rookeries and game preserves. North of the Tamiami Trail the fires were prevented from reaching the Dade-Broward levee by fire fighters, but in all areas the destruction of wildlife was very great, according to State game officials.

"Beginning the 16th, sufficient rain fell to quench the fires and hold the water table, yet there was a deficit of precipitation at the end of the month and more rain is needed.

"Precipitation in the Miami area for May was 1.45 inches at Miami Beach, 1.38 inches in the city, and 3.27 inches at the International Airport 5 miles west of town. In the Lake Okeechobee area rainfall at the Everglades Experiment Station was 4.62 inches, and the water level in Lake Okeechobee had declined to 13.49 feet M. S. L. on June 1. Evaporation from the standard pan at the Everglades Experiment Station was 6.932 inches. The mean maximum temperature was 90.3 degrees and the mean minimum temperature was 63.3 degrees.

"Tests on the effectiveness of chlorinated naphthas in killing underwater mosses were made on a lateral canal at Osborne's grove near Ft. Lauderdale in cooperation with members of the Everglades Experiment Station staff. The chemicals were applied on May 1, using an underwater spray rig which was constructed at the Experiment Station. The rig was essentially a gear-type pressure pump which pumped the chemical from a supply tank into a main supply pipe line from which 1/4-inch pipes 1 foot apart and approximately 6 feet long were tapped in at right angles. These pipes were capped by ring nozzles from which the chemical issued beneath the surface of the water under a gage pressure of approximately 40 lbs. per square inch. The nozzle pipes and frame were connected to the pump by a flexible hose for ease in manipulation. The entire rig was placed in a light aluminum boat which was pulled along the ditch by ropes at the proper speed. The eight nozzles used on this ditch were mounted on a rigid frame and were handled by a man from the stern of the boat. They were held under the surface of the water so that they ejected the spray as close to the bottom of the ditch as feasible. Manual control was needed to prevent the dense aquatic moss growth from fouling the nozzles.

"About 12 hours prior to treatment the water was drained from the ditch to an average depth of about 1 foot. This was just sufficient to float the boat but required less chemical for obtaining the pre-selected concentration determined for use. Inasmuch as the chlorinated naphthas are toxic to fish, the lowering of the ditch prior to treatment apparently resulted in the desertion of this ditch by the bass and other game fish for deeper water, while the gar and other undesirable species remained and were killed. Several hundred gar but only one or two small bream and no bass were observed killed by the treatment, although numbers of bass and bream were noted in the ditch prior to lowering the water. At the time of the treatment the growth of the mosses was very dense and the ditch was practically blocked of drainage for all practical uses. Similar growth resulted in a measured

value of the retardance coefficient 'n' in the Manning formula of from 0.40 to 0.90 as contrasted to 0.04 for the mechanically cleaned channel of an adjoining ditch.

"Three different chemicals were tried. All were made by Esso, or Standard Oil, of New Jersey, and sent to the Everglades Experiment Station for further formulation and tests. Seven stretches 150 feet long were laid out along the ditch for treatment, with an intervening 'balk' of from 50 to 100 feet between courses where no treatment was applied. This served as a check on results. The elements of treatment and the observed results are given in the following table, which appears on the next page. As noted, treatment with WSl492 gave very encouraging results and the WSl494 treatment shows promise. Apparently WSl495 is not worth the application. An observation made 6 weeks after application shows that the only growth in the channel was a small amount which appears to be coming from the remains of the plants along the very edges of the banks which were above water and hence did not come into contact with the chemical during the original application. It is possible that a small amount applied from the banks and as a 'clean-up' operation would have completely killed the few plants. It is significant that an adjoining ditch cleaned by draglines last summer showed a very heavy regrowth in less than 6 weeks, which indicates that the chemical treatment may have an inhibiting effect on the growth. Further tests on a larger reach of ditch are planned for the coming month to find the proper field method of application and to determine the most economical amount that can be applied and still give a good kill. Since the cost of the chlorinated naptha promises to run about 30 to 40 cents per gallon, this treatment may prove more economical than the use of the more expensive chlorinated benzenes with a high specific gravity than water."

Drainage Studies - M. H. Gallatin, Homestead, Fla. - "With the exception of a few very light showers during the period May 1 to May 22, it was very dry with a steady, constant decline in the water table. With extremely heavy rains falling on May 23 over nearly all of the area and rains occurring nearly every day during the remainder of the period we had a rapid rise in the water table to the end of the period.

"The following table gives the total rainfall for the month of May for our various gages for the years 1947 to 1950.

Gage location	May 1950	May 1949	May 1948	May 1947	May 1946
Redland and Mowry	6.52	4.45	4.42	5.84	18.81
Sub-Tropical Expt. Sta.	7.95	3.43	4.11	5.95	13.05
Redland and Gossman	5.62	2.02	6.94	7.64	
Plummer and Comfort	5.54	2.87			
Peters, Fla.	2.42	4.61	6.63	4.94	
Princeton Grove	9.34	6.47	4.12	6.60	15.15
Cooper Grove	10.40	5.96	4.42	9.97	
W. Mowry	5.80	5.93	4.63	3.05	
E-33	5.10	3.16	6.83	3.31	
Roberts and Avocado	7.58	3.75	3.37	5.12	
Jeran Grove	5.59	5.16			
Country Club and Waldin	4.95	4.23			
Piowaty Grove	7.91				
East Glades	6.69				

"Rains were recorded on 18 days during May. Rains of over 1 inch: were recorded on May 17 at Gage 6, on May 24 at gages 6 and 9, on May 25 at gages 2, 3, 4, 12, and 13; on May 26 at 13 and 14; on May 31 at gages 2, 7, and 13.

Course	Average width (Ft.)	Average depth (Ft.)	Surface acreage	Formulation used	Amount material used (Gals.)	Approximate concentration used (P.P.M.)	Percent Kill observed 31 days after Application
A1	10.2	0.94	0.0154	WSL492	2.50	527	over 95%
A2	10.3	1.10	.0198	WSL492	2.50	308	over 95%
B	8.8	.77	.0303	WSL492	1.95	256	over 95%
C	10.7	.90	.0368	WSL492	3.89	359	90%
D	10.4	.91	.0358	WSL495	3.11	292	30%
E	8.9	.95	.0306	WSL495	2.72	286	30%
F	9.8	1.00	.0337	WSL494	2.72	247	85%
G	8.6	.83	.0296	WSL494	2.72	339	75%

Chemical applied 5/1/50

Notes:

6/1/50

Course:

A1 Channel clear of moss except for few plants along both edges of ditch.

A2 Channel clear of moss. Few plants along edges.

B Channel clear of moss. Moss in courses that was above water line at time of application appears to be unharmed.

C Heavy stand of moss between courses B and C. Channel clean. Little heavier growth along edges of ditch.

D Little evidence of kill

E Same as course "D"

F Slightly more live plants than in courses A, B, and C. Fair stand above water line.

G Heavier stand of live moss than in course F.

"Rains of over 2 inches were recorded on May 16 at gage 7, on May 23 at gages 1 and 8, on May 24 at gages 4 and 12.

"Rains of over 3 inches were recorded on May 23 at gage 14.

"Rains of over 4 inches were recorded on May 23 at gages 1, 2, 3, and 6.

"Rains of over 5 inches were recorded on May 23 at gage 7.

"With only light scattered showers occurring before May 22, a constant steady decline in the water table was recorded for the area. Losses ranged from 0.23 to 0.99 foot. With the heavy rains which fell from May 23 to the end of the month we had a rapid rise in the water table. Gains in the water table for the area ranged from 0.27 to 2.29 feet. In the central and southern portion gains ranged from 0.14 to 1.36 feet while for the northern portion losses ranging from 0.02 to 0.59 foot were recorded.

"Readings at Well # 5 read daily at noon show that during intense heavy rains the water moves through the oolitic limestone both horizontally and vertically quite rapidly. Readings made on May 23 at noon and again at 3:00 p. m. showed that the water table had come up 0.39 foot. On May 24 when 0.16 inch fell in the vicinity and 3.5 inches were recorded to the north and west, we had a continued rise in the water table for 3 days following the rain.

"During the period May 1 to May 22 with little or no rain, readings in the natural cover and check plots increased rapidly. Readings in the shavings, pine straw and grass mulched plots increased slowly. Readings in all plots decreased during the final portion of the period though the decrease was slower for the shavings. Following the 4-inch rain on May 23 which was of short duration (about 2 hours) layers of the shaving plot were dug into. We found that this rain had not penetrated more than 2 inches.

"For the first part of the period with little or no rainfall occurring no loss in nitrates was recorded. During the latter part of the period from May 23 to the end of the month samples were collected just prior to the heavy general rain then again resampled 1 day after the rain and again about a week later. Results of this sampling show that the losses ran comparatively high but where higher organic fertilizers were used they had built back at the sampling 1 week after the heavy rain."

Drainage Studies - C. B. Gay, Fleming, Ga. - "May 4 was spent at Possum Corner Plantation in Jasper County, S. C., with a group considering recommendations for the development of some swamp and marsh lands for agricultural use as well as wildlife. The group consisted of Mr. William Voigt, Jr., Executive Director of Izaak Walton League of America, Mr. Bill Baldwin of U. S. Fish and Wildlife Service, Mr. Bill Neely of SCS, Mr. Farris Highsmith, plantation superintendent, Mr. Lumpkin, attorney for Mr. H. N. Slater, the owner, and also present was Mr. Manning, an interested landowner from Columbia. The group studied the area and felt that the swamp should remain as is, and possibly the open marsh could be developed for pasture and management for water fowl depending on the engineering feasibility, and the owner's desires. This study afforded an opportunity for exchanging of ideas and joint planning. Mr. Voigt was quite interested in the results which were based on consideration of all factors including land capacities, economic feasibility, water control and not drainage, and the place of wildlife."

Drainage Studies - T. W. Edminster, Blacksburg, Va.-"Mr. Walter Turner reports that permeability and moisture equivalent determinations have been run on approximately 17 sites during the month of May. Mr. Turner reports:

"Amounts of precipitation varied widely with different localities. Rainfall at the Lee farm was approximately 0.75 of that at the Presson farm about 12 miles away. Mr. J. E. Rawls called attention to the fact that soils on his farm stayed too wet to cultivate after rains from 1 to 2 days longer than those on the Lee farm just 2 miles away. He attributed this fact to heavier rainfall at his farm than at the Lee farm. (A standard rain gage was installed on the Rawls farm to check this observation.)

"Even though the above conditions kept surface soils wet, little effect was noted in the positions of the water tables until the last week of the month. Rains occurring late May 29 caused a water-table rise of 0.6-foot at the Lee farm, 0.4-foot at the Rawls farm, and 0.8-foot at the Presson farm. The table, which appears on the next page, shows these observations in detail.

"At present, it is believed that precipitation prior to May 29 brought the moisture content of the soil profiles up to the saturation point and that later precipitations influenced the positions of the water tables under observation.

"It is shown in the table that the time required for water tables to rise to a peak varied from 1 day after heavy precipitation ceased at the Rawls farm to 4 days at both the Lee and Presson farms. Differences in amounts of precipitation and depths in soil to water tables undoubtedly had great effect upon the rate of change of water-table positions. Likewise, differences in soil permeability at the water-table depth and below had an influence on this rate. However, the following physical condition should be noted.

"Observations at the Rawls farm were taken at the mid-point between two 120-foot spaced, 2-1/2-foot depth tile laterals while at the Lee farm observations were taken 83 feet from the point of pumping--almost one and one-half times the distance. However, it is doubtful if artificial drainage had much effect upon the position of the water table on the Lee farm since the effective depth of pumping was about 0.2-foot deeper than the phreatic surface. At the Presson farm, the depth to the phreatic surface was more than 2.5 feet deeper than the point of pumping, therefore, artificial drainage had no effect upon the position of the water table at this site.

"Due to the great distance between project field headquarters at Suffolk and the Norfolk City Prison farm in Princess Anne County, it was not possible to note conditions in that area as detailed as in Nansemond County. However, Mr. Inge, Prison Superintendent, stated that this spring had been exceptionally dry. There was no rain during May that halted farm operations. At the same time, data collected at Site 8 by Mr. S. H. Davis indicate that from 0.3 to 0.5 inch of precipitation per week was enough to cause the water table to rise from a depth of 4.2 feet April 28 to 2.8 feet May 22.

Supplemental Irrigation in Virginia Agricultural Production - T. W. Edminster, Blacksburg, Virginia.-"The total rainfall for the month at the irrigation plots was 6.10 inches. No rain occurred during the week of May 16-23 so the pasture irrigation system was operated. Seven settings were made before the rain on May 26 which completed one application of 1.5 inches for the two irrigated plots. From the moisture depletion study, an application of 1.3 inches was needed on the wheat and alfalfa plots on May 24 as the available moisture was then 50 percent of field capacity. An application of only 1 inch was made because of lodging in the wheat plots."

Table 1.--Amounts of precipitation and depths to water table for drainage observations
in work group 20--May 1950

Date	Site 4--H. G. Presson			Site 12--S. W. Lee			Site 10--J. E. Rawls			Site 8--City of Norfolk		
	Precip. from prev. date	Depth to water table at well 311	Feet	Precip. from prev. date	Depth to water table at well G-IV	feet	Precip. from prev. date	Depth to water table at well 177 ¹	Feet	Precip. from prev. date	Depth to water table at well 160	
	Inches			Inches			Inches			Inches		
Initial date--April 24												
May 1	1.26	-		0.80		3.8	-		23.2	0.75	3.6	
8	.70	-		.43		3.6	-		-	.30	3.1	
15	.88	-		.78		3.9	-		2.4	.38	2.9	
18 ³	Trace	7.20					-		2.4			
22	.33	7.41		.55		3.9	40		2.5	.62	2.8	
29	1.25	7.69		1.48		4.0	1.37		2.3	.30	3.0	
30	-	-		0		3.7	.91		1.9	(5)		
31	1.02	7.08		0		3.5	0		2.1			
June 1	0	6.93		0		3.4	.11		2.2			
2	0	6.93		0		3.4	0		2.3			
3	0	6.90		0		3.4	0		2.4			

¹Mid-point between 120-foot spaced tile laterals--tile depth 2.5 feet.

²Initial observation May 3, 1950, well installed 2 days.

³Initial observations.

⁴Initial observation covering period May 20 to May 22.

⁵Data not received after May 29, 1950.

IRRIGATION AND WATER CONSERVATION DIVISION

Informal Assistance, Wells A. Hutchins, Berkeley, California.-"Pursuant to requests from Frederick Ohrt, who is a member of the constitutional convention of the proposed State of Hawaii, Mr. Hutchins devoted some time to a section relating to water which it is proposed to offer for inclusion in the proposed State constitution."

Water Spreading for Recharge of Underground Basins - A. T. Mitchelson, Dean C. Muckel, Eldred S. Bliss, Curtis E. Johnson.-San Joaquin Valley.-"The field ponds near Bakersfield were inspected twice during the month. Canal water is still available at Minter Field for spreading on the experimental plots. The large ponds (6 acres in area) have been operated continuously for the past month and it is estimated that water will be available for another month. Judging from the decrease in percolation rate on the gin-trash-treated pond, the moisture from rains was not sufficient to incubate it. It is evident that one of the most important problems we have in connection with the use of gin trash on large areas is the determination of when a soil is incubated sufficiently to stimulate percolation. During the incubation period, the percolation rate decreases very rapidly; therefore, for proper management the soil should be fully incubated prior to actual spreading operations. At present we have no method by which we can determine definitely whether or not a soil has been incubated. It is suspected that this will have to be some measure of soil aggregation. Soil microorganisms, although apparently very important in causing aggregation, do not reflect the extent of aggregation.

"During the month an experiment was set up to determine how rapidly micro-organisms decompose cotton-gin waste and its parts as compared with other plant materials used for increasing water intake during water spreading. The materials used in this test are as follows: gin trash, cotton bolls, cotton stems, cotton leaves, alfalfa, redwood sawdust, bermuda grass tops and roots. These plant materials will be incubated at optimum moisture for periods of 1/2, 1, 2, 4, 8, 12, and 18 months. After the decomposition period, the flasks containing the partly decomposed material will be dried and weighted to determine the amount of decomposition.

"Preliminary tests were completed using Oronite Quarternary Ammonium Chloride detergent in percolation studies with artificially packed soil columns. A 100-ppm. solution gave beneficial results as indicated by a slight increase in percolation rate in only one tube which had been previously treated with another detergent. The concentration of Oronite used in these tests failed to reduce the number of micro-organisms present in the test soil. Additional studies using both higher and lower concentrations of Oronite are contemplated.

"An experiment was set up to test the effect of water extracts of gin trash on the percolation rate of soils under long submergence. Three groups of percolation tubes containing Hesperia sandy loam were given treatments as follows: four tubes supplied with tap water and served as controls, four tubes supplied with leachate from gin trash allowed to soak continuously in tap water, four tubes supplied with filtrate from a mixture of gin trash and water which had been allowed to ferment for several days. During the 13-day duration of the experiment the control tubes dropped off only slightly in percolation rate. The tubes receiving the gin-trash leachate and the tubes receiving the gin-trash filtrate immediately dropped to very low percolation rates.

"In conjunction with experiments to study the aggregating effect of cotton-gin trash on different soils, two sets of small glass percolation tubes were set up.

One set of six tubes was packed with untreated Hesperia fine sandy loam surface soil from the Wasco plots; the other set of six, with Exeter sandy loam surface soil from the Minter Field plots. Both soils were first sieved through a 3.3 mm mesh screen. All tubes were packed in the packing machine designed in the laboratory with the intent of bringing them to a uniform volume weight. However, it was found that the maximum density that could be obtained with the Wasco soil was 1.55 gm/cc while the minimum density to which the Minter soil could be packed was 1.65 gm/cc. Mechanical analysis of the two soils, shown in table 1, do not appear sufficiently different to explain the pronounced difference in packing characteristics. Examination shows considerably more aggregation in the Wasco soil and is undoubtedly an important factor. Aggregation studies are being made on both the soils."

Table 1.

Soil	Sand 2mm 50u	Silt 50u 2u	Clay 2u ::	Total gravel 2mm
Hesperia F.S.L. (Wasco Soil)	75.4	15.6	9.0	1.97
Exeter S.L. (Minter Field Soil)	73.4	19.7	6.9	5.60

Soil Sampling with Utah Machine - E. S. Blise, Berkeley, California.-

"Three days were spent in the Santa Ana Basin with D. C. Muckel getting volume-weight samples with the Utah soil-coring machine.

"Several cores were taken in the light loamy sands of the Cucamonga-Mira Loma vineyard area. A great deal of difficulty was encountered due to the soil core collapsing inside the tube after the machine had cut from 6 inches to 2 feet. However, by taking the cores in areas where soils were near field capacity and in 4 to 6 increments, it was possible to get satisfactory volume-weight samples to a depth of 6 feet. When these soils were much below field capacity, cores could not be taken. Attempts to get cores in some light and medium-textured soils that were far below field capacity also led to a great deal of difficulty and pointed up the previous experience that for most soils, good results can only be obtained when the soil is a little below field capacity.

"Two excellent cores were obtained in a heavy-textured soil with strong profile development in a poor-drainage area near San Bernardino. Several people from the San Bernardino County Engineer's office who saw these cores taken, were much interested in the machine and technique."

Imperial Valley Drainage Investigations - Geo. B. Bradshaw, Imperial, California.-"The deflocculated surface soil condition on the 160-acre Wilson leaching plot was disked and worked up to determine its effect on the surface infiltration rate. This deflocculated surface layer was built up during the first, second, third, and fourth leaching runs which aggregated 196 days of leaching. The surface in the leaching ponds as noted in the fifth leaching run, as compared with the third and fourth leaching periods. Field inspection, however, indicated that the broken up deflocculated clods were rapidly dissolving and settling into another deflocculated surface layer. This observation was made during the second day of the fifth leaching run. If leaching periods were performed intermittently with

cropping it would tend to minimize the effect of deflocculation on the surface intake rate."

San Fernando Valley Drainage Investigation - Wm. W. Donnan, Los Angeles, California.- "In connection with analysis of deep well data from about 100 deep wells in San Fernando Valley, the hydrographs of 20 key wells have been plotted. It has been found that there has been little or no reduction in the average yearly water level even though the past 3 years have been excessively dry. This factor, coupled with the finding that all the rainfall on the adjacent mountains cannot be accounted for as runoff or consumptive use, lends substantiation to the theory that there is considerable deep percolation of rainfall into the underground aquifers. This deep seepage is in turn maintaining the present levels in the valley floor wells. A second important finding from the hydrographs is that the water levels in most of the wells range from 760 to 800 feet above sea level. By coincidence, the drainage problem area also occurs in a belt of land in the valley ranging from 760 to 800 feet above sea level."

Irrigation in the East - H. Blaney, Los Angeles, California.-

1. Preliminary computations of monthly consumptive use of water in Mobile, Ala.; Orland, Fla.; Birmingham, Ala.; Louisville, Ky.; and Norfolk, Va., areas in Region 2, were made for various crops by correlation of monthly temperature, humidity, precipitation, and percent of annual daytime hours with measured evapo-transpiration in Western States.
2. At the request of A. Carnes, Regional Engineer, the following irrigated areas in Region 2, were visited and information collected on irrigation practices and sprinkler equipment:
 - (a) Mobile, Ala., (truck, potatoes, beans, and corn)
 - (b) Quincy, Fla., (shaded tobacco)
 - (c) Orlando, Fla., (clover pasture and oranges)
 - (d) Sanford, Fla., (truck crops, sub-irrigated)
 - (e) Savannah, Ga., (truck and rice)
 - (f) Charleston, S. C., (truck)
 - (g) Florence, S. C., (potatoes, tobacco, and pasture)
 - (h) Spartanburg, S. C., (peach trees)

While at Spartanburg, assisted the Regional Engineer, A. Carnes, and Irrigation Engineer, George Renfro, in compiling data for an Irrigation Guide for Piedmont Area, North Carolina. During the course of the trip over the areas, conferences were held with most of the members of the Research staff working in Region 2. Dr. T. S. Buie, Regional Director, was interviewed at Spartanburg.

At the request of W. S. Atkinson, Regional Engineer for Region 1, the following areas having problems in sprinkler irrigation were visited:

- (a) Hagerstown, Md. (apples and peach orchards)
- (b) Northampton, Mass., (potatoes, truck, and tobacco)
- (c) Hyannis (Cape Cod), Mass., (truck, potatoes, and cranberries)

Attended an irrigation meeting of District Conservationists called by State Conservation at Ithaca, N. Y. John Lamb, Research Specialist for SCS and members of the Cornell University staff were interviewed.

A day was spent at Upper Darby, Pa., (headquarters for Region 1) assisting the Regional Engineer, Atkinson, and Zone Technicians compile data for Irrigation Guide. A conference was held with Dr. Patrick, Director of the Region."

Irrigation Studies - I. D. Wood, Denver, Colorado.-"In Wichita Falls, Tex., I had a conference with Extension and Soil Conservation Service personnel for the purpose of outlining an educational program for the Wichita Falls Irrigation District of about 30,000 acres. Irrigation practices in this district are considerably below par. Soil conditions are difficult due to large amounts of sodium brought in with the irrigation water.

"The Soil Conservation District organized several years ago is getting started with some good work in cooperation with the Extension Service and Irrigation District. What is needed now is an educational campaign consisting of tours, irrigation demonstrations and meetings to popularize the program."

Snow Surveys and Irrigation Water-Supply Forecasts - J. H. Stockwell, Ft. Collins, Colorado.-"The last formal snow reports for the season, based on May 1 surveys, were published on May 9. The water-supply outlook followed the pattern as indicated by snow surveys made earlier in the season. The summer flow of the Green River in Wyoming is expected to be nearly twice normal. The North Platte, Yampa, and White rivers will have slightly above normal flow during the snow-melt season. For the Upper Colorado, Gunnison, and South Platte and its tributaries the water-supply outlook is about average. Deficiencies may be expected in water supply on the Arkansas River, Rio Grande, and San Juan Rivers and their tributaries. The flow of the Rio Grande in New Mexico will be near the minimum of record.

"Special snow surveys were made in the North Platte Drainage on May 15 and June 1. These were made in an attempt to determine in advance if Seminoe Reservoir will spill causing damage at the Kortes dam site as it did last year. At the present time the indication is that there is about one chance in five that the reservoir will spill. It is planned to continue these late season surveys for a few years in an attempt to determine the source of error in forecasting this important stream. Arrangements have been made to measure summer precipitation in the mountains on two watersheds near Ft. Collins to check this factor as a correction to forecasts.

"May precipitation has been above normal in Northern Colorado, so the water-supply outlook is slightly improved over May 1.

"The transcript of the Colorado River Forecast Committee meeting at Boulder City has been prepared and will be ready for mailing about the second week in June. The transcript for the Rio Grande forecast committee is being partially prepared by the Water Facilities Division of Region VI in Albuquerque."

Friction Losses in Pipes and Fittings - Carl Rohwer, Ft. Collins, Colorado.-"The report on Friction Losses in Selected Valves and Fittings for Irrigation Pumping Plants is now in the hands of the printer. The plates for the drawings and pictures have been received from the engraver. The report is being published as a technical bulletin of the Colorado Agricultural Experiment Station. Copies of the bulletin should be available early in July."

Performance Tests of Well Screens - Carl Rohwer, Ft. Collins, Colorado.-
"Tests of the head losses through a Johnson No. 20 screen when surrounded by 1, 1/2, 1/4, 1/8 and 1/16-inch gravel were completed this month. These tests show a progressively increasing head loss as the size of the gravel decreases. A graph of the results of these tests has been prepared for the Johnson Well Screen Company as they are particularly interested in the effect of the fine gravel on their screens. Some changes were made in the test equipment to provide more water for washing the gravel in the envelopes.

Seepage Losses from Irrigation Channels - C. Rohwer, Ft. Collins, Colorado.-"A progress report on last season's work on this project on the results of the seepage ring tests has been submitted to the cooperators on the project. Mr. Ralph Rollins is preparing a report on the soil where these tests were made."

Snow Surveys and Water-Supply Forecasting - W. D. Criddle, Boise, Idaho.-
"As of May 31, 1950, the water-supply outlook for irrigation as indicated by snow surveys appears to be excellent. Also, the apparent high flood potential that existed at the first of the month is believed to be much less critical now than earlier. Below normal precipitation during May over much of the Basin together with cool weather has allowed a considerable part of the snow pack to melt and run off at a relatively low rate. However, there is still considerable snow on the watersheds and with proper weather conditions, damaging high water could still occur in a number of places throughout the Basin."

Snow Surveys - A. R. Codd, Bozeman, Montana.-"Snow surveys completed on or about the first of May indicated an increase in snow-water equivalent over the April first surveys. At some locations this increase was so marked that the already above normal snow fall on April 1 would produce damaging high water with this abnormal increase during April. This was particularly pronounced on the Columbia River Basin. The Missouri Basin received it's share of this April snow-fall and sub-basins which were slightly deficient were brought up to normal for May 1.

"Snow surveys made by the U. S. Forest Service in the Columbia River Basin on or about May 15 indicated a light drop in snow-water equivalent. This drop was very small at the higher elevations where the bulk of the snow pack remains. The snow-melt season is progressing very similar to last season, with cold nights, warm days, and no appreciable rainfall. Should this pattern continue on through June as it has during the last 15 days of May, the high water danger will probably diminish to a well-rounded hydrograph with an excellent supply of irrigation water this season.

"Two hundred and forty-four copies of the May 1 snow-survey bulletin were distributed to subscribers. Because the May 15 bulletin contained only data from the Columbia River a good many of the Missouri River subscribers were deleted from the list and only 109 bulletins were mailed. News releases were made to the United Press through the Montana State College Publications Department of snow-survey data as of May 1 and 15. Radio releases were made of this information through the 'Home and Farm Hour' program sponsored by the Publications Department at the college, Extension Service, from radio station KMON in Great Falls, Mont."

Snow Surveys - R. A. Work and W. T. Frost, Medford, Oregon. - "The final snow-survey and water-supply forecast bulletin for Oregon was issued on May 9. Oregon's water-supply outlook for 1950 is generally good.

"R. A. Work attended meeting of Hydrology Sub-Committee of CBIAC at which meeting the sub-committee established a work-group to prepare list of snow courses considered most useful for flood potential forecasting and to suggest expanded schedules of measurements for some or all of these courses. Work also spent some time in Boise working there with Messrs. Criddle and Nelson in evaluation of 1950 snow-flood potential on Columbia river and tributaries.

"As of May 1 and again May 15 the flood potential was very high due to snow cover on watersheds far above normal.

"May was a dry month. Days were unusually cool and nights were cold. Snow melt was slow and orderly. The Columbia at Vancouver rose above flood stage slightly after mid-May and has remained there but the main push is still to come. It is doubtful now if the annual spring peak will be of such high proportions as seemed likely on both May 1 and May 15.

"Mr. Frost completed studies of snow cover-runoff correlations for Clackamas river at Cazadero for use by Portland General Electric Company.

"Mr. Beaumont has worked throughout the month on preparation of final report covering the cloud-seeding activities at Medford last winter.

"Work and Nelson of Boise office are collaborating with Dr. H. G. Wilm, Chief Flood Surveys Section, USFS, Portland in some statistical studies relative to forecasting flow distribution of the Columbia river in relation to snow surveys. "Considerable attention by Work was given toward renewal of various cooperative snow-survey agreements with USFS, USED and USBR.

"Mr. Beaumont made a journey to Arlington, Ore., to consult with Mr. C. A. Smith, Assistant Director, Oregon Extension Service, and representatives of mid-Columbia wheat growers relative to a cloud-seeding project proposed for that area."

Snow Surveys - C. E. Houston, Reno, Nevada. - "May 1 snow surveys in the Sierra bear out the April forecast of an excellent water crop for the coming season with most of the reservoirs to contain carry-over storage in excess of that available for the past 5 years.

Assistance to Operations - W. D. Criddle, Boise, Idaho. - "Soil Conservation Service Operations are planning numerous irrigation training conferences for Soil Conservation Service technicians and also many farmer irrigation demonstrations throughout the entire West this summer. A considerable amount of time was spent assisting Operations in planning these schools and demonstrations. For aid in setting up demonstrations, a report of some 10 pages has been drafted. This report is entitled, 'Suggestions for Conducting Farmer Irrigation Demonstrations.' Mr. Dell Shockley, Head, Irrigation Section, SCS, Portland, is joining as co-author. It is expected that the report will be mimeographed and made available to various SCS technicians throughout the West and will answer many of the questions which these men have on setting up a farmer irrigation demonstration."

Deep Drainage - P. E. Ross, Weslaco, Tex.-"A conference was held on May 17 with R. C. Grandberry, Drainage Engineer for Soil Conservation Service, Operations, from Ft. Worth, Tex. Mr. Grandberry was seeking information regarding the necessity for major outlets for deep drainage in the Lower Rio Grande Valley.

Irrigation Studies - N. P. Swanson, Amarillo, Tex.-"On May 25 and the morning of May 26 a conference was held at the Amarillo Conservation Experiment Station to discuss plans for a program of irrigated pasture research on the Station. Dr. C. J. Whitfield, Project Supervisor, called the meeting. Operations District Conservationists W. S. Amend, B. J. Clutter, and John Perrin, John Underwood, Survey Supervisor SCS, Hugh Clearman, Deaf Smith County Extension Agent, and myself were present. The experience and observations of all were used to develop a tentative research program. Possibly more farmer interest is now focused on irrigated pasture than any other irrigated crop on the High Plains of Texas.

Technical Field Days - N. P. Swanson, Amarillo, Tex.-"One-day technical field days were held at the Amarillo Conservation Experiment Station on May 1, 2, and 5 for SCS Operations personnel. Groups from the Rolling Plains and High Plains of Texas attended on May 1 and 2 and personnel from Western Oklahoma on May 5. Such meetings offer incomparable opportunities to learn and discuss conservation problems from the field with the field technicians."

Irrigation Studies - V. E. Hansen, Logan, Utah.-"The month was devoted primarily to setting up the irrigation system for the experiments on the Greenville Farm at North Logan. The pressure discharge relationship for gated pipe was obtained."

Irrigation Studies - C. W. Lauritzen, Logan, Utah.-"1,131 feet of canal lining were installed at the Wilson Irrigation Company Canal and 300 feet of an old concrete flume resurfaced with shotcrete. The type of linings and the location of these linings are shown in a table which can be secured from the project.

"A quick setting permeameter and a modified seepage meter were designed and built and some seepage measurements obtained in operating canals. This equipment promises to be an improvement over equipment previously used.

"The bed material in a number of canals was sampled and some measurements made on the profile to determine the hydraulic gradient."

Silt Studies - D. W. Bloodgood, Austin, Texas.-"During the month I spent some time with Mr. Ivan Stout, former assistant, in inspecting various buildings that might be suitable for a silt laboratory. The Board of Control desires the present location for another State agency, and sooner or later it will be necessary for us to move to another location. The Board of Water Engineers is handling the situation and will not move until the Board of Control finds us suitable and acceptable quarters for a silt laboratory.

"Silt data for 15 stations have been completed for our annual progress report for the water year ending September 1, 1949. It is hoped to complete this report within the next month or so.

"All current silt data for the months of March and April have been determined and typed for distribution to various cooperating agencies."

Irrigation Studies - S. J. Mech, Prosser, Washington. - "This latest irrigation re-emphasized the wide variation in the infiltration rates for the same field as it goes through a rotation. While in alfalfa, it required a relatively few hours to add the necessary amount of water required to bring the 4-foot depth to field capacity. In row crops, with narrower furrows, faster channel conditions, and consequently a lesser wetted perimeter, the same field has a much slower infiltration. Consequently, it now requires a longer irrigation. It seems strange to irrigate a field 36 hours today, which required only 12 or less to add the same amount when it was in alfalfa. It seems that under general farm conditions, this variation in infiltration leads to the addition of too much water into the soil when in alfalfa, and usually under-irrigation when in row crops. The irrigator is prone to irrigate his alfalfa too long and his row crops too short a time."

7/12/50

